INSTRUCTION MANUAL

MODEL 301

AC MICROAMMETER

FOR SERIAL # _____

- REGULATED POWER SUPPLIES
- ELECTRONIC INSTRUMENTS

Quan-Tech

LABORATORIES INC.

BOONTON, N. J.

INSTRUCTION MANUAL

MODEL 301

AC MICROAMMETER

FOR SERIAL # _____

OFFICIAL RECORDS STATION
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FACILITIES

QUAN-TECH LABORATORIES

60 PARSIPPANY BLVD. BOONTON, NEW JERSEY

TELEPHONE DE 4-8500

MODEL 301 MICROAMMETER

GENERAL

The Quan-Tech Model 301 Microammeter is designed for Current measurement of transistor circuits, magnetic amplifiers, small servo systems, and other similar networks. Its low input impedance and extreme sensitivity make low level current measurement possible without affecting the circuit under test.

Two input probes are provided:

1. A clamp-on probe, which enables quick measurements to be made of currents within the range of 300 microamperes to 100 milliamperes without disconnecting leads in the circuit under test.

2. An insertion probe, which provides for greatest accuracy of measurement over wide current and frequency ranges and with greatest sensitivity (3 microampere full scale meter reading).

SPECIFICATIONS

Sensitivity
With insertion probe, 3 ua to 100 ma full scale.
With clamp-on probe; 300 ua to 100 ma full scale.

Accuracy
With insertion probe, ±2% of full scale at 1 KC.
With clamp-on probe, ±5% of full scale at 1 KC.

Frequency
With insertion probe, flat within ±2%, 50 cycles to 100 KC, -3 db at 10 cycles and 1 MC.
With clamp-on probe, ±5%, 100 cycles to 100 KC, -3 db at 50 cycles and 1 MC.

Input Impedance
2 ohms plus 8 uh, 60 mmf to ground on ranges 3 ua through 1 ma. Negligible impedance and capacitance on ranges 300 ua and 100 ma.

Oscilloscope Connection
0.1 volt into 10 K ohms.

CONTROLS AND INDICATORS The controls and indicators comprise:

1. A power input cord with integral plug which is permanently attached to the instrument at the back.

2. The power switch which is provided with a pilot indicator.

3. The meter range switch which is directly below the meter.

4. The connector for attaching either one of the two probes.

5. An output jack for the connection of oscilloscope or other external instrument.

OPERATION To use Quan-Tech Model 301 Microammeter, proceed as follows:

1. With power switch at OFF, plug power cord into 115-volt, 60-cycle supply.

2. Turn meter multiplier control to 1000.

3. Turn power switch to ON.

NOTE. Although this instrument is completely transistorized, a daily warm-up period of a few minutes is required. If the instrument has not been used for several days, the warm-up period should be extended to 15 minutes. This enables the electrlytic capacitors to reduce their noise by reforming.

4. Select one of the two probes and connect it to the front panel. As a guide for the selection and use of the probes see "Operational Notes" below.

5. Connect the probe to the circuit under test.

6. If meter indication is very small, turn meter multiplier switch to lower value until meter indication comes to mid-scale or above.

OPERATIONAL NOTES

For quickest and easiest measurements, within the range of 300 ua to 100 ma, use the clamp-on probe. This probe is carefully constructed of high permeable magnetic material and the mating surfaces are lapped to insure minimum leakage. This probe forms a transformer having a turns ratio of 1 to 100 when clamped around a wire.

> CAUTION. Although this probe is built as ruggedly as its nature permits, it should be handled with care to avoid damage to or distortion of the mating surfaces. A thin film of light lubricating oil should be applied to the lapped surface from time to time.

For greater sensitivity and accuracy, use the insertion probe. This probe is a current transformer enclosed in a mu metal shield to eliminate stray magnetic pick-up. It has two turn ratios; 1 to 1 and 1 to 100. The 1 to 1 ratio permits measurements down to 3 ua full scale with a noise level less than 0.1 ua.

Care should be taken to avoid excessive currents applied to the probes. When the instrument is adjusted in the range of 300 ua to 100 ma not more than 500 ma DC should be applied. With the insertion probe and in the 3 ua to 1 ma range the DC current should not exceed 10 ma. Larger currents will result in a decrease in the low frequency response and possible distortion. Extremely large currents may destroy the windings in the insertion probe.

Since there is some feed-thru capacity in the probe, it should be used on the low side of high impedance circuits at high frequencies.

Note that each probe is marked with a polarizing dot indicating the positive terminal to give a positive voltage at the output monitor.

This instrument is of the averaging type, calibrated in rms volts for pure sine wave. Allowances must be made for other waveforms.

It should be noted that there is no capacity coupling within this instrument. Consequently, if the input terminals are employed for anything other than the probes furnished with the instrument, DC should not be applied.

MAINTENANCE AND REPAIR

The instrument may be removed from the case by removing two screws on the side and four screws in the back panel. DO NOT REMOVE SCREWS FROM THE FRONT PANEL unless the instrument is out of its case and then only if it would facilitate repair.

The components in this instrument are standard commercial units. Replacement parts can be obtained from Quan-Tech Laboratories, but they also are probably available at your supplier.

In replacing components on the printed circuit board, the iron should be hot enough to make a good solder connection and applied for as short a period as possible. Pressure that might push the copper away from the board while hot should not be applied.

RECALIBRATION If recalibration is needed, proceed as follows:

1. Allow a warm-up period of at least 15 minutes so that the noise level is reduced to a minimum.

2. Using an oscillator tuned to 1 KC, apply 3 ua to the times 1 position of the insertion probe being careful to avoid pick up of stray fields due to large loops.

3. Adjust R7 to give -18 volts from the regulated supply.

4. Adjust R42 until meter reads 3ua on the 3 range.

5. Set current source to 10 ua and adjust R26 for full scale on the 10 range.

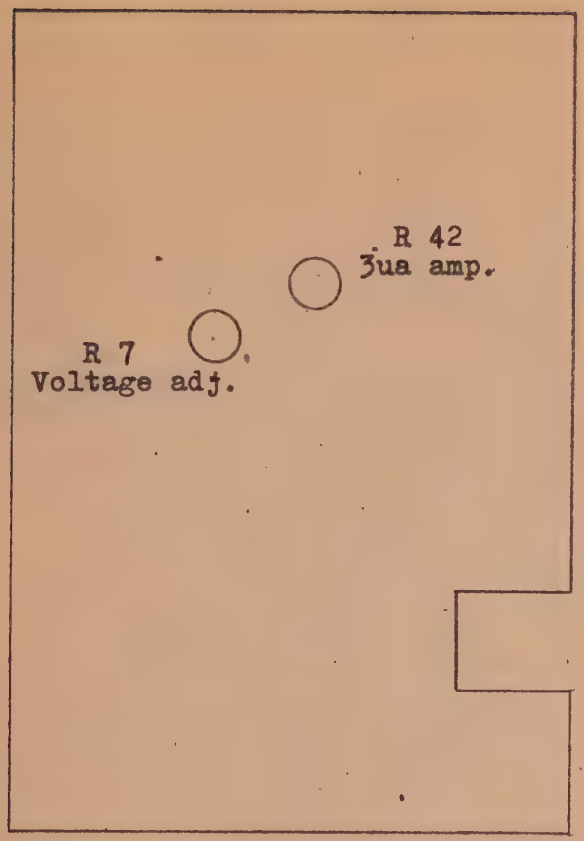
6. Set generator to 30 ua and adjust R29 for full scale on the 30 range.

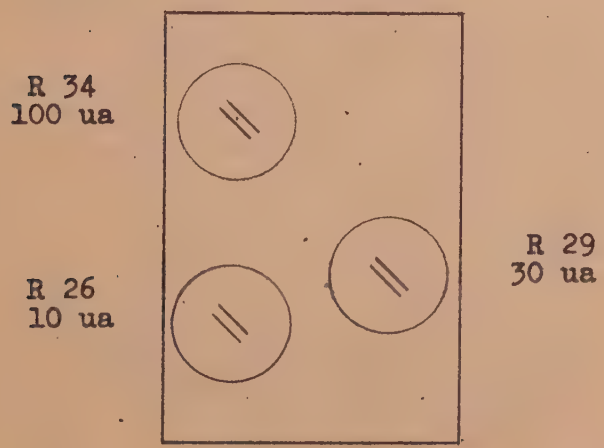
7. Set generator to 100 ua and adjust R34 for full scale on the 100 range.

8. Check ranges 300 and 1000 for alignment. If these positions show more than 1% error, connect an oscilloscope to the monitor output to detect possible stray pickup due to interference. Then repeat the above procedure.

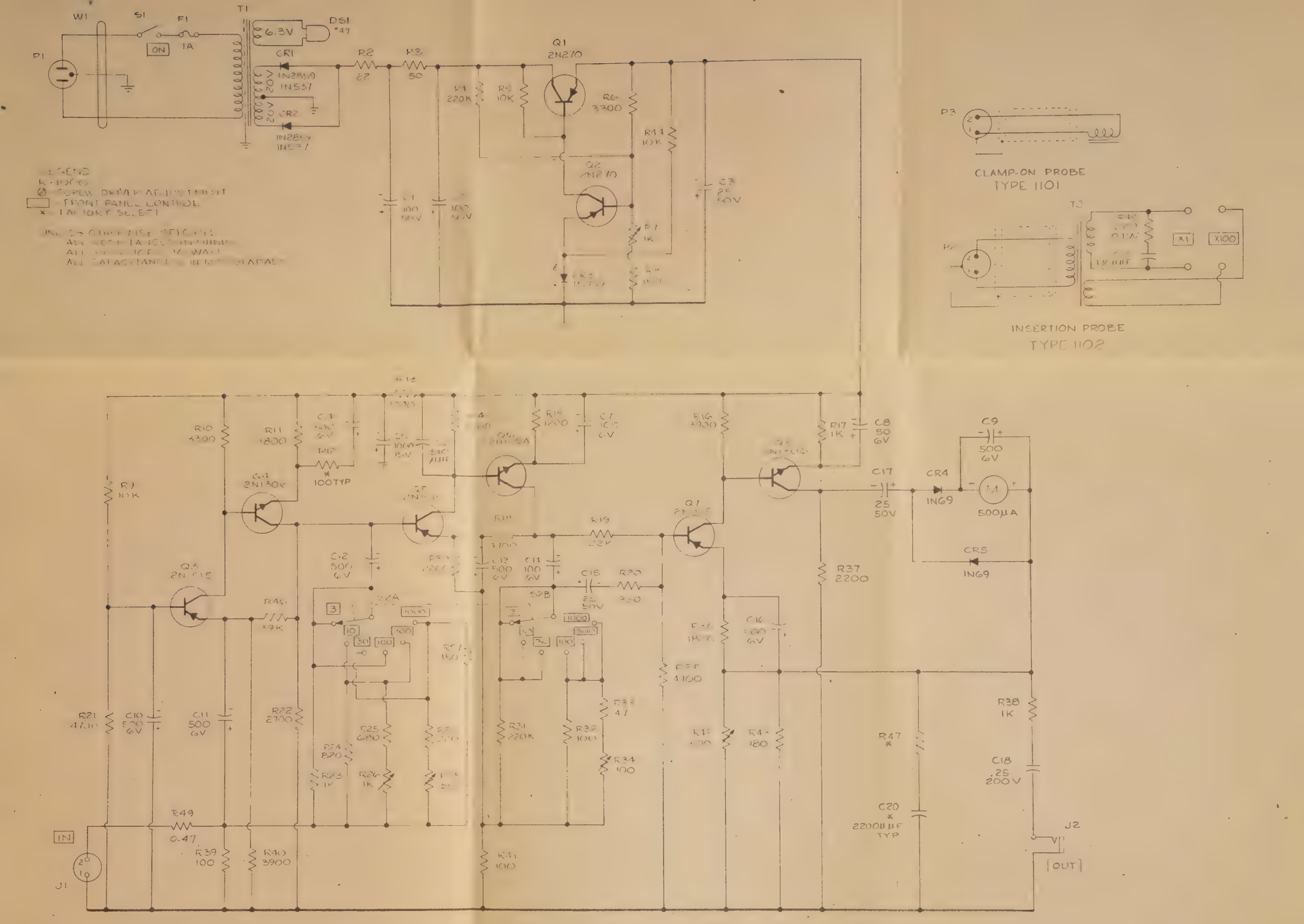
THEORY

Quan-Tech Model 301 Microammeter consists of six transistor stages having a large amount of negative feedback around each amplifier pair. A grounded base input and a feedback factor of nearly unity from the second stage gives an input impedance of approximately 1 ohm and unity current gain. The amplifier pair comprising Q5 and Q6 is a gain stage. The final pair contains the metering circuit. Linearity is achieved by current feedback through the meter and diodes. An output monitor is provided from the feedback resistor in the final stage. A series resistance of 1K ohms and a blocking condenser protect the circuit from severe 1 loading by the monitor. Additional stability and freedom from line transients is obtained from the regulated power supply.





Calibration adjustments



SCHEMATIC
A.C. MICROAMMETER
MODEL 301

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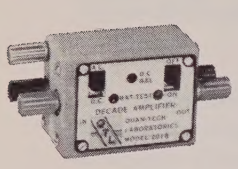
QUAN-TECH INSTRUMENTS

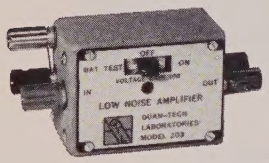


Model 201-B DC-Coupled Decade Amplifier

Highly compact and fully self-contained, the Model 201-B is a stable ac and dc amplifier providing a controlled gain of 10 over a frequency range of dc to 1 MC (±0.5db). Built in battery-condition test indicator. Two or more Model 201-B's may be plugged together in series for greater gain.

Price: $95.00

ADAPTORS: Type 1001, Banana Plug to Banana Plug, Price $2.00; Type 1002, Banana Plug to UHF Plug, Price $4.50; Type 1003, Banana Plug to BNC Plug, Price $4.50.

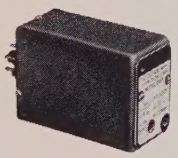


Model 203 Low-Noise Amplifier

Compact, very low-noise ac amplifier with controlled gain of 100. Frequency response flat from 30 cps to 100 kc (±0.5db); down 3 db at 500 kc. Equiv. noise, full bandwidth, 5 μv RMS, input shorted. Narrow band noise approx. 0.005 μv/cycle above 1 kc. Battery operated; fully self-contained; built in battery condition indicator.

Accessory Adaptor plugs:—See Model 201-B above.

Price: $125.00



Model 205 High-Stability DC Amplifier

Fully-transistorized, compact (2″x 2⅞″x1⅜″), providing controlled voltage gain of 10 over frequency range of dc to 100 kc. Maximum output voltage 5 volts p-p. Short-circuit stability of the unit approaches that of chopper-stabilized unit, typical drift being less than 3 mv up to 120°F. At constant ambient temperature, drift is less than 250 μvolts. Octal-pin base permits plug-in installation.

Price: $105.00

Model 301 AC Microammeter

Highly versatile ac current meter providing low input impedance, very high sensitivity, and isolation from ground for low-level current measurements without disturbing circuit under test. Signal output permits display of current waveforms on oscilloscope. Ideal for transistor or magnetic circuit analysis. Sensitivity: With insertion probe, 3 ua to 100 ma full scale; with clamp-on probe; 300 ua to 100 ma, full scale. With 10-amp clamp-on probe (supplied separately) 300 ua to 10 amps.

Price: $290.00

Accessory 10-amp clamp-on probe and connector.

Price: $ 65.00

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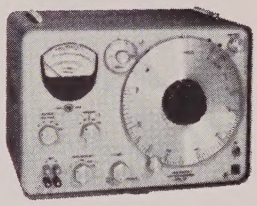


Model 303 Wave and Noise Spectrum Analyzer

Designed especially for use in ultrasonics and noise spectrum analysis. Selection of four constant bandwidths; i.e., 10 and 30 cycles (round top), 100 cps and 1 kc (flat top). Frequency range 30 cps to 100 kc, ±300 cps vernier. Sensitivity: 100 μv to 300 v full scale. Analog outputs provided for external monitoring. Sensitivity of 1 μv full scale with Quan-Tech Model 203 amplifier.

Price: $1425.00

Model 310 Transistor Noise Analyzer

Provides simultaneous analysis of transistor noise at three frequencies. System automatically corrects for variations in transistor gain. Beta, Icbo and Iebo are also included—providing measurements of essential transistor characteristics in one instrument.

Price: $2095.00

Model 311: Similar to above, except that Collector Current Range extends from 5 to 1000 uamp. Collector Current Meter Ranges are: 10, 30, 100, 300 and 1000 uamp, full scale; Icbo and Iebo Meter Ranges: 0.03, 0.1, 0.3, 1 and 3 uamp.

Price: On request

Model 315 Resistor Noise Test Set

For precise, quantitative measurement of noise generated as a result of current passing through a resistor. Tests any resistor from 100 ohms to 22 megohms; conforms to recommended specifications of National Bureau of Standards for resistor noise measurements. Tests diodes and other two-terminal networks as well. Outputs provided for external monitoring or for data processing.

Price: $1700.00

Model 317 Amplitude Distribution Analyzer

Establishes the amplitude-probability distribution of a random signal; for example, to determine threshold requirements, false alarm probabilities, etc. Frequency range: 5 cps to 0.5 mc; Amplitude ranges: 100%, 10% and 1% full scale accuracy. Output to drive counter at front panel. Size 8½″ (h) x 5″ (w) x 6¾″ (d).

Price: $395.00

We welcome requests for information regarding specific applications of Quan-Tech instruments, amplifiers and other products.

Prices and specifications are subject to change without notice. Prices noted are f.o.b. Boonton, N.J., USA.

QUAN-TECH
POWER SUPPLIES

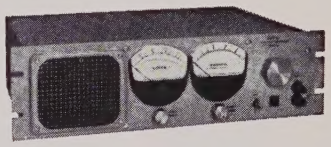
Quan-Tech manufactures an extended line of regulated power supplies, covering a wide range of output voltages, output currents and regulation requirements. Typical examples of standard Quan-Tech units are described below. For full details on Quan-Tech's complete power supply line, write to the address below.

Precision Power Supplies

The 120 Series of precision, solid-state power supplies is characterized by 0.01% regulation. Ripple is less than 500 μvolts, rms. Outstanding features are output voltage and current metering, overload and short circuit protection circuitry, preadjustment of current levels, and remote error sensing.

Model 121	0.1-15 VDC, 0-5 amps	Price: $395.00
Model 122	0.1-36 VDC, 0-3 amps	Price: 395.00
Model 123	0.1-50 VDC, 0-2 amps	Price: 410.00
Model 124	0.1-50 VDC, 0-5 amps	Price: 510.00
Model 125	0.1-32 VDC, 0-8 amps	Price: 510.00

120 SERIES



Model 124

Constant Current Supply

Provides constant output current variable over a wide range, independent of voltage across the load. Ideal for transistor or diode testing, potentiometer noise measurements, strain gage applications, etc.

Price: $290.00

OUTPUT: 0.05 to 500 ma. DC in four ranges: 0.05 to 0.5 ma; 0.5 to 5 ma; 5 to 50 ma; and 50 to 500 ma. Maximum output 20 volts.
POWER INPUT: 105-125 volts, 50-60 cycles, 35 watts.

MODEL 151B

Modular Power Supplies

The 170 Series are extremely compact, solid-state power supplies offering excellent operating characteristics *at unusually low cost.* All models are available in 3 configurations: Suffix B for bench use, Suffix C with all connections through octal plug, and Suffix T with terminal strip. All models regulated to less than 3 millivolts, line or load. Ripple is less than 250 μvolts, rms.

Model	Output Voltage	Output Current	Dimensions	Price
170	10-32	0.25a	3"(h)x4"(w)x5"(d)	$ 98.00
171	10-32	0.50a	3.5"(h)x5"(w)x5.5"(d)	123.00
172	0-32	0.20a	3"(h)x4"(w)x5"(d)	105.00
173	0-32	0.40a	3.5"(h)x5"(w)x5.5"(d)	129.00

170 SERIES

T B C

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In addition to the above standard units, Quan-Tech Laboratories produces custom-designed power supplies for specialized applications. We invite the opportunity to offer consultation on your special power supply problems. Address inquiries to the Power Supply Division, at the address below.

The Instrument Division of Quan-Tech Laboratories produces equipment for the measurement and analysis of component and system noise, as well as specialized amplifiers for instrumentation. For details, see section 2900.